Missouri Department of Natural Resources

Total Maximum Daily Load Information Sheet

Second Nicolson Creek

Waterbody Segment at a Glance:

County: Barton
Nearby Cities: Liberal, Burgess
Length of impairment: 3 miles
Pollutant: Sulfate
Source: Abandoned and reclaimed coal mined lands


State map showing location of watershed

TMDL Priority Ranking: TMDL approved 2004

Description of the Problem

Beneficial uses of Second Nicolson Creek

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health associated with Fish Consumption

Use that is impaired

- Protection of Warm Water Aquatic Life

Standards that apply

- Sulfate and chloride are linked together in Missouri's Water Quality Standards, 10 CSR20-7.031 (4)(L)1. There it states that for streams with a 7Q10 low flow of less than one cubic foot per second (which includes Second Nicolson Creek) the concentration of chloride plus sulfate shall not exceed 1000 mg/L (milligrams per liter or parts per million) for protection of aquatic life.

Background Information and Water Quality Data

Sulfide minerals, commonly found in coal and the surrounding rock, oxidize when exposed to the air and are subsequently dissolved in water. In many old coal mining areas, this weathering process results in large amounts of sulfate dissolved in groundwater and in surface waters draining these mined lands. Freshwater aquatic life cannot tolerate large amounts of dissolved substances in water. The Missouri water quality standard for dissolved substances is 1000 mg/L of sulfate plus chloride (SO_4+Cl). Levels of chloride in Missouri streams is typically much less than 100 mg/L, so most dissolved substance problems are related to high levels of sulfate.

Second Nicolson Creek was placed on the 303(d) list due to some high conductivity measurements. Conductivity significantly correlates with sulfate and chloride levels in streams. Sulfate plus chloride data at two locations on Second Nicolson Creek and one location on Drywood Creek downstream of Second Nicolson Creek are shown in Table 1. Mean (average) sulfate plus chloride levels are less than 1000 mg/L (the standard). However since the standard appears to be exceeded more than 10 percent of the time in Second Nicolson Creek, the stream is considered to be impaired.

A Total Maximum Daily Load document was written recommending a maximum sulfate plus chloride loading equivalent to 970 mg/L. This amount should be protective of aquatic life in Second Nicolson Creek. Land reclamation projects have been completed and improvement is already taking place in the creek. It will continue to be monitored and will be re-evaluated during the next impaired waters listing cycle. The U.S. Environmental Protection Agency approved the TMDL June 9, 2004.

Table 1. Water Quality Data at Three Locations on Second Nicolson and Drywood Creeks, 1997-2004

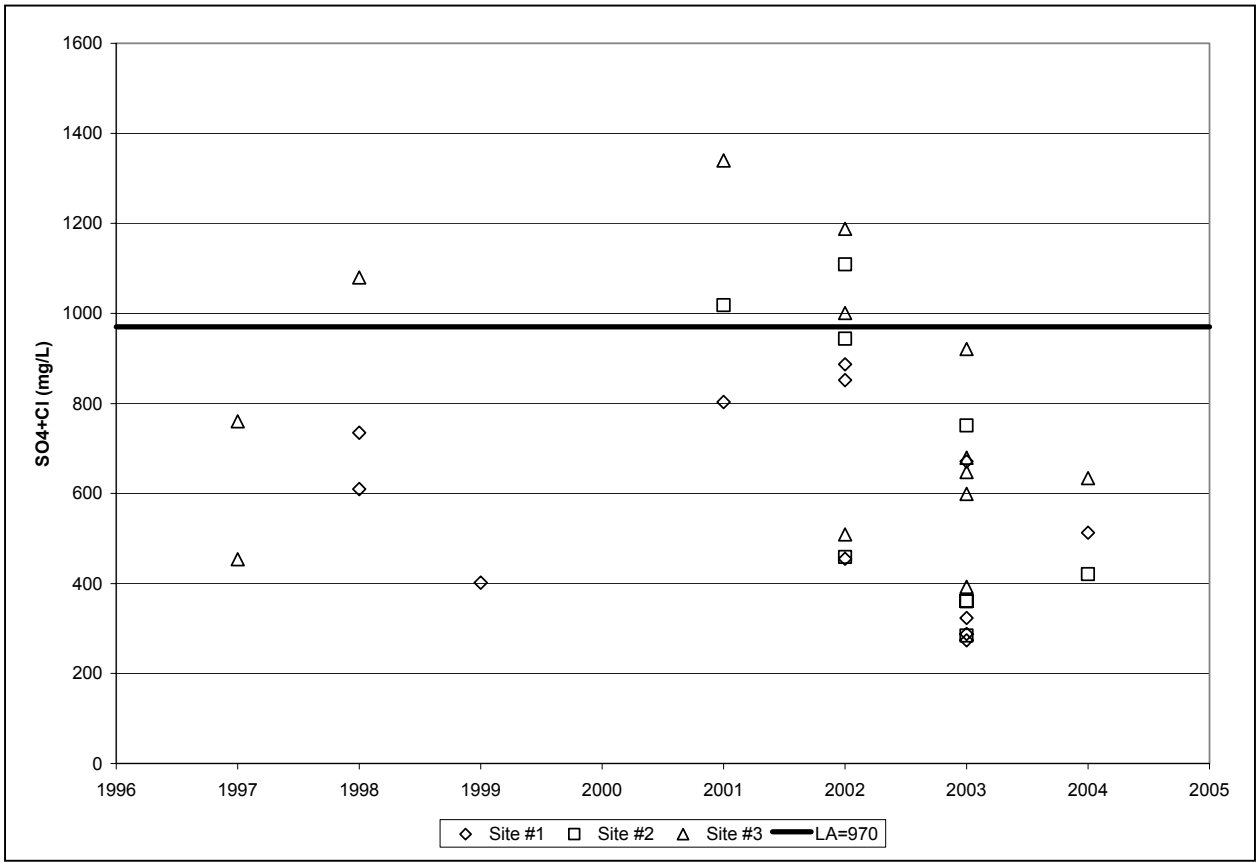
Site	Site Name	Year	Month	Day	SO_4	Cl	SO_4+Cl
3	2nd Nicolson Cr. at Hwy P	1997	7	2	448	6	454
3	2nd Nicolson Cr. at Hwy P	1997	7	30	758	2.499	760.499
3	2nd Nicolson Cr. at Hwy P	1998	9	3	1080		**1080**
3	2nd Nicolson Cr. at Hwy P	2001	10	3	1330	9.9	**1339.9**
3	2nd Nicolson Cr. at Hwy P	2002	8	12	500	9	509
3	2nd Nicolson Cr. at Hwy P	2002	9	25	990	11	**1001**
3	2nd Nicolson Cr. at Hwy P	2002	10	22	1180	8	**1188**
3	2nd Nicolson Cr. at Hwy P	2003	3	6	913	8	921
3	2nd Nicolson Cr. at Hwy P	2003	4	9	673	6.41	679.41
3	2nd Nicolson Cr. at Hwy P	2003	10	23	593	6.21	599.21
3	2nd Nicolson Cr. at Hwy P	2003	10	30	642	5.9	647.9
3	2nd Nicolson Cr. at Hwy P	2003	12	31	385	7.4	392.4
3	2nd Nicolson Cr. at Hwy P	2004	3	24	628	6	634
	Mean value at Site 3						*785.1*
2	2nd Nicolson Cr. NE of Burgess	2001	10	3	1010	8.5	**1018.5**
2	2nd Nicolson Cr. NE of Burgess	2002	8	12	449	10	459
2	2nd Nicolson Cr. NE of Burgess	2002	9	25	936	8	944
2	2nd Nicolson Cr. NE of Burgess	2002	10	22	1100	9	**1109**
2	2nd Nicolson Cr. NE of Burgess	2003	3	6	739	12	751
2	2nd Nicolson Cr. NE of Burgess	2003	10	23	353	7.74	360.74
2	2nd Nicolson Cr. NE of Burgess	2003	10	30	353	7.75	360.75
2	2nd Nicolson Cr. NE of Burgess	2003	12	31	276	8.59	284.59
2	2nd Nicolson Cr. NE of Burgess	2004	3	24	413	8	421
	Mean value at Site 2						*634.3*
1	Drywood Cr. W of Drywood CA	1998	9	3	735		735
1	Drywood Cr. W of Drywood CA	1998	9	22	604	6	610
1	Drywood Cr. W of Drywood CA	1999	6	3	395	7	402

1	Drywood Cr. W of Drywood CA	2001	10	3	793	10.2	803.2
1	Drywood Cr. W of Drywood CA	2002	8	12	442	13	455
1	Drywood Cr. W of Drywood CA	2002	9	25	878	9	887
1	Drywood Cr. W of Drywood CA	2002	10	22	843	9	852
1	Drywood Cr. W of Drywood CA	2003	3	6	657	14	671
1	Drywood Cr. W of Drywood CA	2003	10	23	279	8.62	287.62
1	Drywood Cr. W of Drywood CA	2003	10	30	315	8.43	323.43
1	Drywood Cr. W of Drywood CA	2003	12	31	265	8.95	273.95
1	Drywood Cr. W of Drywood CA	2004	3	24	505	8	513
	Mean value at Site 1						*567.8*

Note: **Bold** entries exceed water quality standards; CA=Conservation Area; W.=west

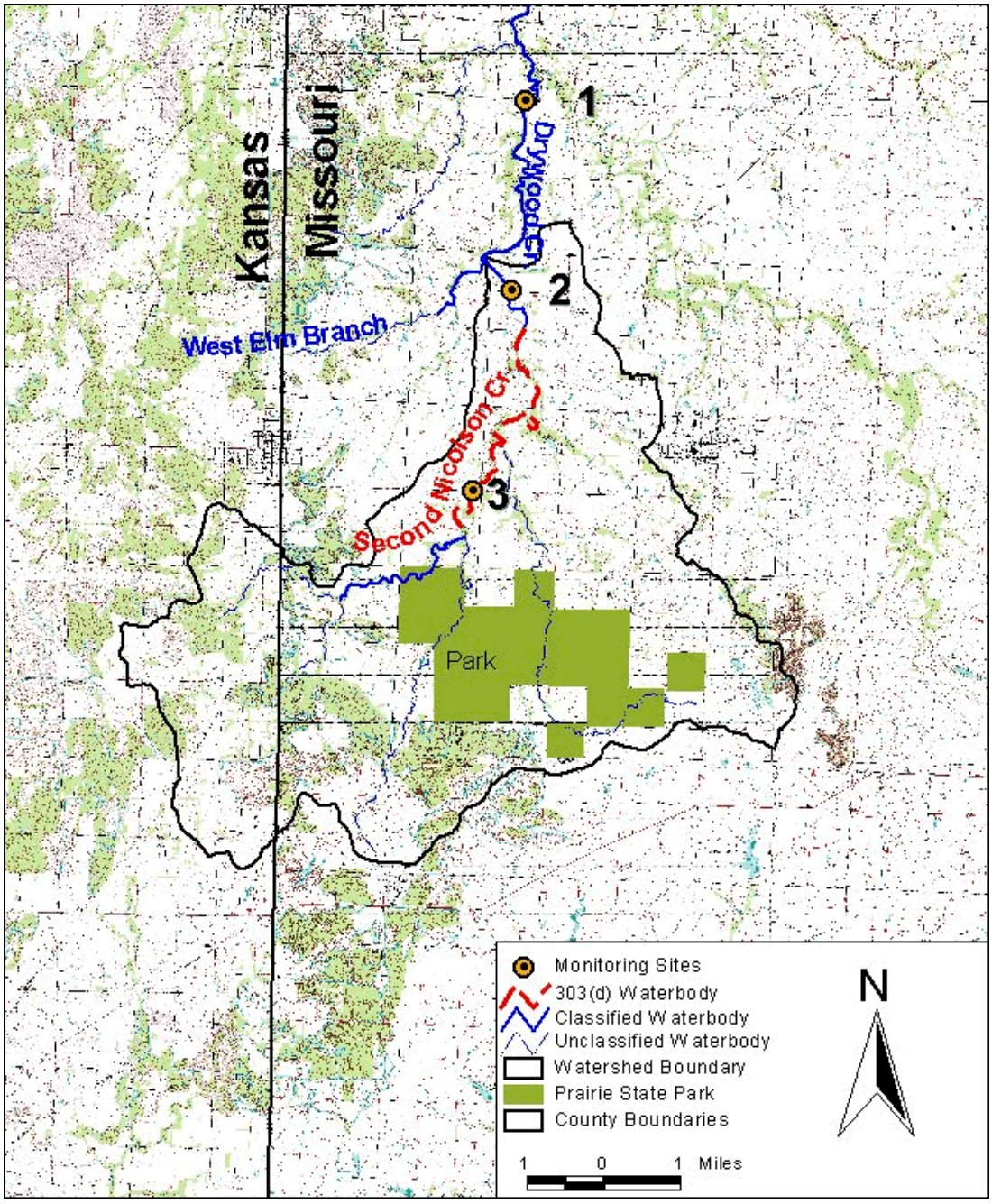
The graph below shows the improvement in sulfate plus chloride in 2003 and 2004. A map showing the impaired segment and the sampling site locations may be found on the next page.

Sulfate Plus Chloride (SO_4+Cl) Concentration Grouped by Site 1997-2004



LA = Load Allocation or the "load" recommended by the TMDL for nonpoint sources. In this case it is a concentration.

Second Nicolson Creek in Barton County, Missouri, Showing Sampling Sites and the Impaired Segment



Impaired Section Outline of Watershed

For more information call or write:
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1-800-361-4827 or (573) 751-1300 office or (573) 526-5797 fax
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